

DIN EN ISO 17034:2017



# Certified Reference Material

## FLX-1003 - Cement

### Certified Values

Parameter	Mass fraction in % <sup>1)</sup>	Uncertainty in % <sup>2)</sup>	Traceable to
Al <sub>2</sub> O <sub>3</sub>	6,92	0,17	NIST SRM 634a
CaO	59,70	0,58	BAM Reinstoff 3
Fe <sub>2</sub> O <sub>3</sub>	1,85	0,09	NIST 1887b
K <sub>2</sub> O	0,885	0,057	NIST 1887b
MgO	2,23	0,11	BAM Reinstoff 6a
Mn <sub>2</sub> O <sub>3</sub>	0,174	0,024	IV-70917 U2-MEB733628
Na <sub>2</sub> O	0,158	0,027	IV-70917 U2-MEB733628
P <sub>2</sub> O <sub>5</sub>	0,104	0,019	NIST 1887b
SiO <sub>2</sub>	23,76	0,33	BAM Reinstoff 1
SO <sub>3</sub>	3,75	0,14	NIST 634a
TiO <sub>2</sub>	0,434	0,039	IV-70917 U2-MEB733628
ZnO	0,012	0,006	NIST 1887b

Table1) Certified Values

1) Certified value traceable to SI unit kg/kg based on ignited material.

2) Total expanded uncertainty  $U_{CRM}$  calculated for a confidence interval of 95% ( $k=2$ ).

The sum of all oxides is **99,995 %**. This excludes informational values and LOI.

This certificate is valid, within the uncertainty specified, **until 18.08.2033**, provided the CRM is handled in accordance with instructions given in this certificate. The certification is nullified if the CRM is damaged, contaminated, or otherwise modified.

Bedburg-Hau, 18.08.2023

**Responsible Reference Materials**  
Susan Aschenbrenner

**General Manager**  
Dr. Rainer Schramm

### Description of the CRM

This reference material is an industrial product and was taken directly from the production stream. The complete batch was sealed into 30 g bottles. This material is normally used as cement for constructions.

### Intended use

Calibration and control sample for x-ray fluorescence (XRF) analysis.

### Informational Values

Parameter	Mass Fraction in % <sup>3)</sup>	Uncertainty <sup>4)</sup>
Cl	0,08 <sup>5)</sup>	-
LOI	7,80 <sup>6)</sup>	-

Table2) Informational Values

3) Only Informational Value, not accredited

4) Total expanded uncertainty  $U_{CRM}$  calculated for a confidence interval of 95% ( $k=2$ ), if present.

5) Based on dried material (1h 105 °C).

6) Based on original material.

### Instructions for the correct use of the CRM

This material is moisture sensitive. This material has to be ignited for minimum 1 hour at 950°C prior use. The ignition process must result in a constant weight. The ignited material must be stored in a desiccator not longer than 24h, then reignition might be necessary. The minimum sample quantity for analysis should be 0,5 g. For XRF use, ignited samples should be prepared as a fused bead, e.g. in accordance with ISO 29581-2:2010.

### Storage Information

The material has to be stored in a dry and clean environment.

### Hazardous situation

For this material an actual MSDS is available.

### Level of homogeneity

In accordance with ISO Guide 35:2017 a homogeneity study was performed. A one-way ANOVA was used to calculate the batch inhomogeneity.

## Stability

In accordance with ISO Guide 35:2017 a stability study was performed. As a result, the stability of the material was considered as fit for purpose. The uncertainty of long term stability was calculated

## Total expanded uncertainty

The total expanded uncertainty  $U_{CRM}$  for a confidence interval of 95% ( $k=2$ ) was calculated by taking into account the uncertainty of characterization  $u_{char}$ , of inhomogeneity  $u_{bb}$  and long-term stability  $u_{lts}$ .

$$U_{CRM} = k \times \sqrt{u_{char}^2 + u_{bb}^2 + u_{lts}^2}$$

## Traceability

All of the certified values derived as part of this testing program have traceability to the reference materials stated in table 1.

## Methods used

The analytical work performed to assess this material was carried out by the FLUXANA laboratory, which works according to ISO/IEC 17025:2018.

In accordance with ISO 17034:2017 and ISO Guide 35:2017, we use the approach stated in ISO 17034:2017 Chapter 7.12.3. d) value transfer from an RM to a closely matched candidate RM performed using a single measurement procedure performed by one laboratory.

An example for this approach is found in ISO 13528:2022-08 E.5. Using this approach, samples of the test material that is to be the new reference material are tested along with matching and/or synthetic RMs using a suitable method. The assigned values  $X_{CRM}$  and their uncertainties  $U_{CRM}$  are then derived from a calibration against the certified reference values of the compared RMs. Synthetic RMs are made from pure chemicals by weighing.

Measurement method used: XRF with fusion as sample preparation technique.

This certificate is in conformance with ISO Guide 31:2015.